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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,975	04/02/2004	James Vogeley	4209-37	7724

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EXAMINER	
DOUGHERTY, THOMAS M	
ART UNIT	**PAPER NUMBER**
2834	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/815,975	VOGELEY, JAMES
	Examiner	Art Unit
	Thomas M. Dougherty	2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-8,11-13,16-19,22,24,26-28 and 31-34* is/are rejected.

7)☒ Claim(s) *3,4,9,10,14,15,20,21,23,25,29,30,35 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 5, 11-13, 16, 22, 26-28, 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Takagi et al. (US 2004/0018100). Takagi et al. show (fig. 8, claims 1, 4, 5) a method for determining a parameter for a piezoelectric actuator (6), the method comprising: applying a drive signal to the piezoelectric actuator (6); operating the piezoelectric actuator (6); obtaining a feedback signal (from 28) from the piezoelectric actuator (6); using the feedback signal to determine a parameter (see paragraph [0132]) of the piezoelectric actuator (6).

The step of operating the piezoelectric actuator comprises using the piezoelectric actuator to pump fluid in a pump.

The method further comprising subsequently using the parameter of the piezoelectric actuator to control the drive signal to the piezoelectric actuator.

Takagi et al. show (fig. 8, claims 1, 4, 5) a drive circuit for sensing a parameter of a piezoelectric actuator (6) operating in a device and for adjusting a drive signal of the

piezoelectric actuator (6) in accordance with the parameter. Again see paragraph [0132].

The drive circuit (20) comprises a controller (22) for controlling a drive signal applied to the piezoelectric actuator; a feedback monitor (see paragraph [0132]) for obtaining a feedback signal from the piezoelectric actuator (6) while the piezoelectric actuator operates; a processor (see 22c in fig. 6) for using the feedback signal to determine the parameter of the piezoelectric actuator (6).

The device is a pump (as labeled) and wherein the piezoelectric actuator (6) operates to pump fluid in the pump. Note in fig. 1 that the inlet is labeled as 1, the pump chamber as 3 and the discharge channel as 2.

The controller (22) subsequently uses the parameter of the piezoelectric actuator (6) to control the drive signal to the piezoelectric actuator (6).

The drive circuit (20) comprises: means for applying a drive signal to the piezoelectric actuator (6); means for obtaining a feedback signal (paragraph [0132]) from the piezoelectric actuator (6) while the piezoelectric actuator (6) operates; means for using the feedback signal to determine a parameter of the piezoelectric actuator.

Takagi et al. show (figs. 1, 6, 8) a piezoelectrically-actuated device comprising: a piezoelectric actuator (6) which is responsive to a drive signal for pumping fluid between the inlet (1) and outlet (2); and a drive circuit (20) for sensing a parameter (paragraph [0132]) of the piezoelectric actuator (6) and for adjusting a drive signal of the piezoelectric actuator (6) in accordance with the parameter.

The device is a pump having a pump body for at least partially defining a pumping chamber (3) having an inlet (1) and an outlet (2) which communicate with the pumping chamber (3), and wherein the piezoelectric actuator (6) pumps fluid between the inlet (1) and outlet (2).

The drive circuit (20) comprises: a controller (22) for applying a drive signal to the piezoelectric actuator (6); a feedback monitor for obtaining a feedback signal (see paragraph [0132]) from the piezoelectric actuator (6) while the piezoelectric actuator (6) operates a processor (22c) for using the feedback signal to determine a parameter of the piezoelectric actuator (6).

The controller (22) subsequently uses the parameter of the piezoelectric actuator (6) to control the drive signal to the piezoelectric actuator (6).

Claims 1, 2, 5, 11-13, 16, 22, 26 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Aoki (JP 06-117377). Aoki shows (figs. 1, 6) a method for determining a parameter for a piezoelectric actuator (22), the method comprising: applying a drive signal to the piezoelectric actuator (6); operating the piezoelectric actuator (6); obtaining a feedback signal (from 22) from the piezoelectric actuator (22); using the feedback signal to determine a parameter (see CONSTITUTION) of the piezoelectric actuator (22).

The step of operating the piezoelectric actuator comprises using the piezoelectric actuator (22) to pump fluid in a pump (10).

The method further comprising subsequently using the parameter of the piezoelectric actuator (22) to control the drive signal to the piezoelectric actuator (22).

Aoki shows (figs. 1, 6) a drive circuit for sensing a parameter of a piezoelectric actuator (22) operating in a device (10) and for adjusting a drive signal of the piezoelectric actuator (22) in accordance with the parameter. See CONSTITUTION.

The drive circuit comprises a controller (31) for controlling a drive signal applied to the piezoelectric actuator (22); a feedback monitor (CONSTITUTION) for obtaining a feedback signal from the piezoelectric actuator (22) while the piezoelectric actuator (22) operates; a processor (31) for using the feedback signal to determine the parameter of the piezoelectric actuator (22).

The device is a pump (10) and wherein the piezoelectric actuator (22) operates to pump fluid in the pump (10).

The controller (31) subsequently uses the parameter of the piezoelectric actuator (22) to control the drive signal to the piezoelectric actuator (22).

The drive circuit comprises: means for applying a drive signal to the piezoelectric actuator (22); means for obtaining a feedback signal (see CONSTITUTION) from the piezoelectric actuator (22) while the piezoelectric actuator (22) operates; means for using the feedback signal to determine a parameter (voltage) of the piezoelectric actuator (22).

Aoki shows (figs. 1, 6) a piezoelectrically-actuated device comprising: a piezoelectric actuator (22) which is responsive to a drive signal for pumping fluid between the inlet (12) and outlet (13); and a drive circuit (31) for sensing a parameter (see CONSTITUTION) of the piezoelectric actuator (22) and for adjusting a drive signal of the piezoelectric actuator (22) in accordance with the parameter.

The device is a pump (10) having a pump body for at least partially defining a pumping chamber (between 12 and 13) having an inlet (12) and an outlet (13) which communicate with the pumping chamber, and wherein the piezoelectric actuator (22) pumps fluid between the inlet (12) and outlet (13).

Claims 1, 5, 6, 11, 12, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Jaenker (US 6,411,009). Jaenker shows (fig. 3) a method for determining a parameter for a piezoelectric actuator (19, 20), the method comprising: applying a drive signal to the piezoelectric actuator (19, 20); operating the piezoelectric actuator (19, 20); obtaining a feedback signal (UL) from the piezoelectric actuator (19, 20); using the feedback signal to determine a parameter of the piezoelectric actuator (19, 20).

The method further comprising subsequently using the parameter of the piezoelectric actuator (19, 20) to control the drive signal to the piezoelectric actuator (19, 20).

The method further comprising subsequently using the parameter of the piezoelectric actuator (19, 20) to control pulse widths of a pulse width modulated signal (outputs of 25) from which the drive signal is derived.

Jaenker shows (fig. 3) a drive circuit for sensing a parameter of a piezoelectric actuator (19, 20) operating in a device and for adjusting a drive signal of the piezoelectric actuator (19, 20) in accordance with the parameter.

The drive circuit comprises a controller for controlling a drive signal applied to the piezoelectric actuator (19, 20); a feedback monitor for obtaining a feedback signal (UL) from the piezoelectric actuator (19, 20) while the piezoelectric actuator (19, 20)

operates; a processor (26) for using the feedback signal to determine the parameter of the piezoelectric actuator.

The controller subsequently uses the parameter of the piezoelectric actuator (19, 20) to control the drive signal to the piezoelectric actuator (19, 20).

The controller subsequently uses the parameter of the piezoelectric actuator to control pulse widths of a pulse width modulated signal (outputs of 25) from which the drive signal is derived.

Claims 1, 7, 8, 11, 12, 18, 19, 22 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Kitani (US 6,229,245). Kitani shows (fig. 7) a method for determining a parameter for a piezoelectric actuator, the method comprising: applying a drive signal (via 23, 25) to the piezoelectric actuator; operating the piezoelectric actuator; obtaining a feedback signal from the piezoelectric actuator (from section S); using the feedback signal to determine a parameter of the piezoelectric actuator.

The method further comprising: varying the drive signal through a range of excitation frequencies (col. 5, ll. 57-59); obtaining a voltage value from the feedback signal (fig. 2A) for each of the excitation frequencies, determining a resonant frequency (Frs) of the piezoelectric actuator as corresponding to a frequency in the range that had a minimum voltage value from the feedback signal.

The method further comprising determining the resonant frequency of the piezoelectric actuator as corresponding to the frequency in the range that had a minimum peak voltage value from the feedback signal. Figure 2A shows a peak voltage

value at the resonant frequency which is equivalent to a minimum impedance value for the voltage sensed.

Kitani shows (fig. 7) a drive circuit for sensing a parameter of a piezoelectric actuator operating in a device and for adjusting a drive signal (outputs of 23, 25) of the piezoelectric actuator in accordance with the parameter.

The drive circuit comprises a controller (20-25 and 27) for controlling a drive signal applied to the piezoelectric actuator; a feedback monitor (output from section S and 26) for obtaining a feedback signal from the piezoelectric actuator while the piezoelectric actuator operates; a processor (20) for using the feedback signal to determine the parameter of the piezoelectric actuator.

The controller varies the drive signal through a range of excitation frequencies (col. 5, ll. 57-59); and wherein the output monitor obtains a voltage value from the feedback signal for each of the excitation frequencies; and wherein the processor determines a resonant frequency of the piezoelectric actuator as corresponding to a frequency in the range that had a minimum voltage value from the feedback signal.

The processor determines the resonant frequency of the piezoelectric actuator as corresponding to the frequency in the range that had a minimum peak voltage value from the feedback signal. Figure 2A shows a peak voltage value at the resonant frequency which is equivalent to a minimum impedance value for the voltage sensed.

The drive circuit comprises: means for applying a drive signal (via 23 and 25) to the piezoelectric actuator; means (output of section S) for obtaining a feedback signal from the piezoelectric actuator while the piezoelectric actuator operates; means for

using the feedback signal to determine a parameter (output of 26) of the piezoelectric actuator.

As noted, the processor determines the resonant frequency of the piezoelectric actuator as corresponding to the frequency in the range that had a minimum peak voltage value from the feedback signal. Figure 2A shows a peak voltage value at the resonant frequency which is equivalent to a minimum impedance value for the voltage sensed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. (US 2004/0018100) in view of Jaenker (US 6,411,009). Given the invention of Takagi et al. as noted above, they do not show that their controller subsequently uses the parameter of the piezoelectric actuator to control pulse widths of a pulse width modulated signal from which the drive signal is derived.

Given the invention of Jaenker as noted above, he does not show a pump.

It would have been obvious to one having ordinary skill in the art at the time of the invention of Takagi et al. to employ a controller that uses a detected parameter to

control pulse widths of a drive signal because the circuit employed saves energy as noted at col. 2, lines 35-43.

Claims 33 and 34 are is rejected under 35 U.S.C. 103(a) as being unpatentable over Takagi et al. (US 2004/0018100) in view of Kitani (US 6,229,245). Given the invention of Takagi et al. as noted above, they don't show their controller varying the drive signal through a range of excitation frequencies; and wherein the output monitor obtains a voltage value from the feedback signal for each of the excitation frequencies, and wherein the processor determines a resonant frequency of the piezoelectric actuator as corresponding to a frequency in the range that had a minimum voltage value from the feedback signal.

Given the invention of Kitani as noted above, they don't show a pump.

It would have been obvious to employ the pump structure of Takagi et al. in the invention of Kitani so that the Kitani device could do useful work.

Allowable Subject Matter

Claims 3, 4, 9, 10, 14, 15, 20, 21, 23, 25, 29, 30, 35 and 36 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator driving a pump controlling the drive signal so that an ascertainable electrical charge is applied to the piezoelectric actuator; obtaining a

voltage value from the feedback signal; using the electrical charge and the voltage value from the feedback signal to determine capacitance of the piezoelectric actuator; the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator driving a pump varying the drive signal, monitoring the feedback signal as the drive signal is varied for an "echo"; determining a resonant frequency of the piezoelectric actuator as an inverse of a period of the echo; the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator driving a pump the controller controls the drive signal so that an ascertainable electrical charge is applied to the piezoelectric actuator; wherein the feedback monitor obtains a voltage value from the feedback signal; and wherein the processor uses the electrical charge and the voltage value from the feedback signal to determine capacitance of the piezoelectric actuator.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The remaining prior art cited reads on at least some aspects of the claimed invention.

Direct inquiry to Examiner Dougherty at (571) 272-2022.

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November 29, 2005

Thomas M. Dougherty
TOM DOUGHERTY
PRIMARY EXAMINER